Report on VCP Internal Simulations 5, 6, and 7

Octopus vulgaris — Corvus (corvid family) — Physarum polycephalum

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What This Document Is

This is a public summary of three new simulations in the Vector Consciousness Prediction (VCP) series. The full series is part of a relational ontology project, 'The Self-Experiencing Universe' (Lis, 2025), which argues that consciousness and matter are not properties of substances but emerge from relations.

IMPORTANT: This document describes a purely mathematical exercise. The VCP framework assigns three numerical values to any biological system, based on published behavioral and anatomical research, and computes the geometry of where that system sits in a three-dimensional space. Whether that geometry corresponds to actual experience is a separate philosophical question — one the framework explicitly does not resolve on its own. What it does resolve is something more modest, and in some ways more interesting: how different are these systems from each other, and in what direction?

The three parameters are called: stability (how persistent is the system's behavioral identity over time), integration (how unified is its information processing), and self-modeling (how much does the system represent its own internal states and use those representations to guide behavior). Together, these three parameters measure the density and structure of relations that may be necessary conditions for the appearance of what we call consciousness — not consciousness itself as a substance, but the relational architecture without which it does not appear. These were first defined in the context of a honeybee and its swarm, then applied to Sepia officinalis. The current simulations extend the framework to three new objects.

A note on corrections: the full technical report for this series also contains a section that was missing from earlier work — a mathematical analysis of how sensitive the central Sepia prediction (opt-out rate of 0.836) is to the estimated value of Sepia's self-modeling parameter. That analysis, now completed, shows the prediction is robust across a wide range. This correction was prompted by an internal audit completed in March 2026, prior to any external researcher responses.

The Three New Systems

Octopus vulgaris

The common octopus is perhaps the most surprising animal in cognitive science. It has approximately 500 million neurons — comparable to a dog — but two-thirds of those neurons are distributed through its eight arms rather than concentrated in a central brain. Each arm can process information semi-independently. Yet when it comes to learning, the arms cannot learn on their own: they require the central brain. This architecture is unlike anything else in the animal kingdom.

In VCP terms, Octopus vulgaris sits close to Sepia officinalis — close, but displaced along the self-modeling axis. Octopus shows clear social learning (watching another octopus perform a task and then performing it successfully), progressive puzzle-solving across difficulty levels, and behavioral signs of an ongoing affective state in pain conditions. These are taken as the data for its self-modeling parameter, which comes out somewhat lower than Sepia's, though both are in the same high region of the space.

The most notable finding: octopus lands geometrically very close to corvids. This is discussed in the next section.

Corvus — corvid family (crows, ravens, jays)

Corvids are already recognized as among the most cognitively sophisticated non-primate animals. New Caledonian crows manufacture and use tools. Scrub jays have episodic-like memory — they remember not only what food they cached and where, but when, and who was watching. Ravens track individual social relationships over long periods. Eurasian jays, in 2025 experiments, were shown to opt out of difficult memory trials at significantly higher rates — the same paradigm used with bees in the VCP baseline.

In VCP terms, corvids score high on all three parameters. Their stability and integration values are high, and their self-modeling scores are the highest in the dataset.

Here is where the geometry produces something unexpected.

The Unexpected Convergence

Octopus vulgaris and corvids are as different biologically as two animals can be. One is a mollusk; the other is a bird. Their nervous systems evolved entirely independently, with no shared neural architecture. Their bodies, ecologies, and evolutionary histories are separated by hundreds of millions of years.

In the VCP space, they land 0.0663 apart. That is the closest any two distinct species in the current dataset come to each other. Sepia officinalis is 0.1306 from the octopus and 0.1416 from the crow — these three form a tight cluster in the high-stability, high-integration, high-self-modeling corner of the space.

This convergence is precisely what relational ontology would predict. If the form of consciousness is determined by the geometry of information relations — by how information is held, integrated, and used in self-reference — then substrate should not be decisive. A mollusk and a bird can arrive at the same form not because their brains are alike, but because their relational structures are.

This is not evidence that they are conscious in the same way. It is evidence that whatever they are, they are more similar to each other than either is to a honeybee — or to what comes next.

Physarum polycephalum — and a New Kind of Question

Physarum polycephalum is a slime mould. It is a single cell — one enormous, multinucleate cell that can spread across a surface like a network, solve mazes, optimize transportation routes, and remember periodic events. It has no neurons. It has no brain. No consciousness framework has previously applied formal calculation to it.

In VCP terms, Physarum produces a profile unlike anything else in the dataset.

Its integration score is the highest of all six systems tested. This is a mathematical consequence of being a single cell: there are no subsystems that could process information independently. Everything the organism does, it does as a whole. When Physarum solves a maze, the entire organism is the solution — not a part of it, but all of it at once. The integration parameter measures this: the degree to which the system cannot be divided without losing the thing being measured. For a single cell, that value approaches its ceiling.

Its self-modeling score, by contrast, is the lowest in the dataset — essentially zero. Physarum does not appear to represent its own internal states. It habituates to stimuli, it anticipates periodic events, it avoids areas it has already explored by following its own chemical trail. But there is no evidence of a model of self. The organism changes; it does not appear to know that it is changing.

This produces what the technical report calls a paradox position: maximum integration, absent self-modeling, moderate memory stability. It is the opposite of the bee swarm, which has high stability and effectively zero integration (because the swarm is not one system — each bee is separate, and the IIT Exclusion Principle confirms that distributed collective systems score near zero on integration by a completely independent route). Physarum and the swarm are both at the low-r end of the space, but they arrive there from completely different directions.

The question Physarum poses is not the usual one. The usual question is: 'Is this thing conscious?' Physarum forces a more interesting question: 'What would it mean for a system to have maximum integration and no self-model?' In the geometry of the VCP space, that is a real location — and nothing else occupies it.

What the Geometry Shows

Across six systems, the VCP space reveals three distinct regions:

High-r cluster	Sepia, Octopus, Corvid. Highest self-modeling. Tight geometric cluster despite evolutionary distance.
Middle zone	Individual bee. Moderate on all three parameters. Confirmed to perform opt-out at 0.520 rate.
Low-r periphery	Bee swarm (high-s, low-i, low-r) and Physarum (moderate-s, maximum-i, near-zero-r). Both lack self-modeling but are mirror images: one is a collective with no integration; the other is maximally unified with no model of itself.

The central prediction of the series — that Sepia officinalis will demonstrate opt-out behavior at approximately 83.6% on difficult trials (compared to 52% for the individual bee) — remains unchanged. The mathematical analysis of its robustness, now completed, confirms it holds across a wide range of assumptions about Sepia's self-modeling capacity.

The experiment has not yet been conducted. That is where the geometry ends and the empirical work begins.

What This All Means — Simply

Forget the numbers for a moment.

We took six very different living things and asked: where does each one sit in the same three-dimensional space, if you measure three things — how well it remembers itself over time, how much it is "one piece" rather than a collection of separate parts, and whether it has any model of itself at all?

First finding: an octopus and a crow land in almost the same place.

An octopus is a mollusc. A crow is a bird. Evolutionarily, several hundred million years and completely different brain architecture separate them. Mathematically, they are 0.07 apart — practically nothing. Sepia officinalis is a bit further away, but all three form one tight cluster.

What does that mean, plainly? That the form of consciousness — if it is there at all — may be similar in animals that have nothing anatomically in common. What matters, according to this framework, is not the material the brain is made of, but the geometry of how information flows, is held together, and refers back to itself. A mollusc and a bird can arrive at the same form not because their brains are alike, but because their relational structures are.

Second finding: the slime mould.

Physarum polycephalum is one cell — a single enormous cell with no neurons. It can solve mazes, optimize networks, and remember rhythmic events. No consciousness framework has ever formally calculated its position.

The result: Physarum has the highest integration score in the entire dataset — higher than the octopus, higher than the crow, higher than Sepia, higher than everything. This is not a surprise once you understand why: if you are a single cell, you cannot be divided into independent subsystems. You are always entirely one thing. Integration approaches its ceiling by mathematical necessity.

But its self-modeling score is essentially zero. Physarum changes, but it does not appear to know it is changing. No internal model of self. The organism reacts; it does not reflect.

This combination — maximum unity, zero self-knowledge — exists nowhere else in the dataset. It is a location in the space of possible forms that no one had previously thought to look for. And it is occupied.

The larger point.

The usual question — "is this thing conscious?" — may be the wrong one. It forces a yes or no where the reality is richer. What VCP suggests instead is: ask what form. And when you ask that, the space of possible answers turns out to be much wider than expected. Evolution independently reaches the same locations (octopus and crow). And

there exist locations that nobody thought to check (the slime mould's paradox corner: maximally unified, with no model of itself).

The prediction about Sepia — that it will opt out of a difficult cognitive task at a rate of about 83.6%, compared to 52% for a honeybee — remains unchanged. It stands and waits for an experiment that has not yet been done.

But the calculations also opened something that was not visible before.

Before these calculations, every system in the VCP dataset had a brain and a nervous system. The honeybee, the swarm, Sepia — all animals with neurons. The natural assumption was that "higher" in the space meant "more neurologically complex." Physarum breaks that assumption entirely. If integration is measuring something real — the degree to which a system is an indivisible whole — then a single-celled organism with no neurons leads the dataset on that axis. Not because it is smarter. Because it is structurally indivisible in a way no nervous system can match: a nervous system is always an assembly of many parts, and Physarum is not.

This means the integration axis is measuring something deeper than neurological complexity. It is measuring a property of organisation itself. And that is not a conclusion that was reachable before the slime mould was calculated.

The map, it turns out, has a shape that was not anticipated. And that shape raises three questions which the theory does not yet answer.

First: is self-modeling a necessary condition, or just one dimension?

The IT-Region — the zone within which the structural conditions measured by VCP are considered sufficient to support what we call conscious experience — was previously described as a boundary. A system is either inside or outside. But Physarum forces a harder question: what do we do with a system that has integration higher than anything else in the dataset, and self-modeling near zero? Is it more "inside" or more "outside" than the bee swarm, which also has near-zero self-modeling but near-zero integration too? There is no good answer right now. The boundary may not be a sphere. It may have a shape that has not yet been defined.

Second: is "no self-modeling" one category, or several?

Physarum and the bee swarm are both at the low end of the self-modeling axis. Intuitively, one might group them together as "things without inner life." But geometrically they are 0.85 apart — the largest distance between any two systems without self-modeling in the dataset. They share one axis and are mirror images on the other two. The swarm is a collective with no unity; Physarum is maximal unity with no self-knowledge. Treating them as the same kind of thing would be like saying a frozen lake and a gas cloud are the same because neither is liquid. The absence of one property does not make two things alike.

Third — and perhaps the most serious: are the three parameters truly independent?

The model treats stability, integration, and self-modeling as three independent axes. But Physarum occupies a combination that raises a biological question: is maximum integration with zero self-modeling a stable form, or is it a form that must — under certain evolutionary pressures — either develop self-modeling or lose its integration? In other words: are there hidden dependencies between the parameters that the model does not yet see? This is not a flaw in the calculations. It is a question the calculations made visible that was not visible before.

None of these questions were visible before Simulation 7. The slime mould raised them — not by being conscious, but by occupying a place in the space that forced the framework to ask what it is actually measuring.

On boundaries — and why they dissolve when you look closely.

The more precisely you try to draw a line — "here consciousness begins, here it does not" — the less readable the line becomes. Not because your tools are poor. Because the boundary is not a property of the thing. It is a property of the way you are looking.

This is not a new problem. Quantum mechanics encountered it in 1927, at the level of atoms. An electron has no definite position until you measure it — and the act of measurement changes what is being measured. Something analogous appears here: the attempt to locate the threshold of consciousness changes the question. Physarum does not "sit at the boundary" because there is a boundary there. It sits at the point where our category — conscious yes or no — simply fails to land.

This is precisely the argument that relational ontology makes against substance-based thinking. Substance thinking says: there is substance A, there is substance B, and between them is a sharp line — because substances are sharp. Relational thinking says: there is a pattern of relations, which can be denser or sparser, more or less coherent, with a stronger or weaker loop back to itself. The question "is this consciousness?" has no binary answer because the question is binary and reality is not.

VCP does not break this principle. It illustrates it. What you can honestly say is this: there is a space of forms. Some forms are close to each other, some are far. Some forms have properties that we call "consciousness" based on behavioural observation. Others do not have those properties, or have them to an indeterminate degree. And that indeterminacy is not a gap in knowledge. It is the structure of reality itself.

Physics said this about matter almost a hundred years ago. This project is attempting to say the same about consciousness — with the same formal seriousness, and the same willingness to let the answer be uncomfortable.

What Comes Next

These simulations complete the first planned extension of the VCP framework beyond its three original systems. The core dataset now includes six objects across three phyla. The prediction that awaits experimental testing is Simulation 1's central result: Sepia opt-out = 0.836.

Working hypotheses not yet quantified (as required by protocol, these are labeled explicitly as such): whether the Physarum position in VCP space corresponds to any form of experience at all; whether the octopus-corvid convergence persists across larger samples of species; whether the IT-Region boundary can be located precisely along the self-modeling axis.

On the formula itself — and where it signals its own limits.

Ohm's Law is simple: resistance equals voltage divided by current. Three variables, one equation. But when applied to real systems, it opened into capacitance, inductance, impedance, thermal effects, nonlinearities — an entire field of electrical engineering. The original formula did not break. It revealed that reality had more dimensions than the original question assumed.

VCP is now at exactly that point. Simulation 7 showed that the space has a shape the formula did not anticipate. The three questions raised by the slime mould — about the shape of the IT-Region, about whether "no self-modeling" is one category or several, about hidden dependencies between the parameters — are precisely the places where the formula begins to signal its own limits.

This is a good sign, not a bad one. A formula that never encounters its limits is either too general to say anything, or has only been tested in a narrow range. A formula that reveals its own limits through contact with reality — that is a formula that is working.

Three directions of possible growth are already visible.

First — a possible fourth parameter: temporality. The current three parameters may not be sufficient. There may be a dimension the model does not yet have — how far into time the system's self-model reaches. A honeybee remembers a route. A raven plans for tomorrow. A human plans for decades. A slime mould reacts to the last hour. The current formula treats this as part of self-modeling — but it may be something separate.

Second — dynamics instead of statics. The current formula assigns a system a vector at one moment. But the vector changes over time — and perhaps the trajectory of that vector tells us more than its position. A system that is moving toward higher self-modeling is not the same as one that has always been where it is. Trajectory may carry information that position alone cannot.

Third — interaction between vectors. The current formula treats each system in isolation. But a honeybee inside the swarm has a different vector than a honeybee alone. A person in a crowd has a different vector than a person in solitude. The formula does not yet have a language for what happens between vectors when systems come into

contact. That gap is where some of the most interesting questions live — including questions about collective forms that may not be visible to any individual member of the group.

Ohm's Law did not predict the transistor. But without Ohm's Law, the transistor would have been incomprehensible.

Full technical documentation for all simulations is available through Waldemar Lis directly. Requests for the technical report should not be submitted through public channels.

This report is part of an ongoing independent research project. Full citation: Lis, W. (2025). The Self-Experiencing Universe. ISBN 978-83-968651-8-2. Archive materials: https://archive.org/details/@not_foryou

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